MUON WALL SCINTILLATOR MOUNTING SCHEME
at
CDF

This packet contains information on engineering calculations for the scintillator mounting scheme on CDF's North and South Muon Walls. This packet is intended to be used by mechanical safety panel personnel to determine if this mounting design is viable and safe for installation and operation.

prepared by:
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installation to begin
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CDF: MUON WALL SCINTILLATOR SUPPORT SCHEME

OVERVIEW:

Two, 300 Ton muon walls located at CDF are to be covered with scintillator material. It takes approximately 58, 11 feet x 1 foot x 1 inch scintillators to cover one side of the muon wall. The approximate weight of the scintillator is 110 Lbs.

It is proposed to mount these scintillators on 9, P3300 unistrut stringers. Each stringer will be attached onto a W10.5 x 73.5 tee-beam located at the top of the muon wall and supported only at each end. Refer to drawing number 2563.2-ME-297889. The scintillators overlap at the center of the wall. The overlapping portion of the outer scintillator (to include the photo-multiplier) is supported by the inner scintillator. The remaining portion of the outer scintillator is supported by three, P3300 unistrut stringers. The inner scintillator is supported by six P3300 unistrut stringers.

A finite beam analysis was performed on both the inner and outer scintillators to determine the distributed load onto the unistrut stringers. The combined load on each stringer was then applied to the T-beam to determine its stress and deflection. Moments were also calculated and added to the analysis due to the off-neutral-axis loading. The maximum combined stress in the T-beam was calculated to be 12,300 psi. The deflection of this beam in the center was determined to be -.286 in. A stress analysis was also performed on the T-beam support arms and the maximum combined stress was found to be 18,446 psi. The allowable stress in this case is 23,760 psi. For the T-beam itself, the allowable stress, as given in the *Manual of Steel Construction*, 9th edition, equation F1-6, is given as 16,657 psi.

Weld and bolt calculations were performed and designed to meet AISC codes. Detailed calculations are contained in this package. Proper torque and welds are indicated on all drawings.

A stress analysis on the P3300 unistrut stringers showed a combined stress (almost exclusively in tension) of 8,151 psi. Because each scintillator is mounted 1 3/16" off of the unistrut neutral axis, a moment is generated causing the unistrut to develop a slight bow inward toward the muon wall. To remove this bow and to stabilize the unistrut, nylon bolts will be used as a wall stop and will be placed every 4 feet.

CONCLUSION:

This assembly allows for easy removal of any scintillator at any time. Fabrication and assembly should be very easy and will require only minimal amount of welding and drilling. This structure adheres to all AISC codes.

Distribution:
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Pat Lukens   Project Physicist
John Grimson   CDF Senior Engineer